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well as students who work alone. Since one advantage of CAI is its
ability to individualize and thereby improve instruction, some
explanation is needed as to how equivalent learning can be effected
in groups. A model of differential interpretation of feedback is
offered which explains how individualized learning can take place
within a group setting. The model asserts the importance of careful
design of feedback statements for optimum individual learning within
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DIFFERENTIAL INTERPRETATION OF FEEDBACK

IN SMALL GROUPS

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Differential Interpretation of Feedback in Small Groups

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Several studies have suggested that students working in
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Differential Interpretation of Feedback in Small Groups

A number of studies of programmed instruction (PI) (Hartley, 1966; Sawiris, 1966; Kay, Dodd, & Sime, 1968) and computer-assisted instruction (CAI) (Goodman, 1968; Love, 1969; Cartwright, 1972, 1973; Cohen, 1975; Okey & Majer, 1975) have suggested that students who work in groups learn as well as students who work alone. Comparisons of individual performance between students working alone and students working in groups usually indicate no significant differences in mean learning scores or variances (Cartwright, 1973).

In most of these studies, small group discussion is utilized to achieve response consensus. With CAI for example, the group is asked to converge on a single response which is then evaluated by the computer. Feedback from the computer is based on that single group response.

Bearing in mind the role of reinforcement in the learning process, it may well be asked how such generalized feedback in response to collective group action can affect the learning of an individual. This is especially true if that individual did not agree with, or even participate in, the original response decision.

It is difficult to imagine how the performance of an individual, learning under such circumstances, can equal the performance of individuals working alone. The question is an important one, especially for those who espouse group work, since there is a positive relationship between the number of people in each group and the potential

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number of disagreements therein.

One possible explanation is that where there is disagreement among group members, generalized feedback is differentially interpreted by the various group members. It is suggested that each group member interpreted the feedback message in light of his original contribution to the group decision-making process and not to the explicit response finally entered. Although the computer provided feedback in response to the group decision, that feedback was differentially interpreted by each group member. The following simplistic example illustrates this point.

A group of three working on a psychology lesson is asked by the computer to name the pathways which conduct from receptors to the central nervous system. Two members of the group incorrectly believe the answer to be "efferent". The third member thinks the answer is "afferent" paths. He is out-voted and the incorrect response is entered. The computer evaluates the response and returns the feedback message, "No, the correct answer is 'afferent'." Each group member reads the same feedback statement. However, while they all read the same words, the message content varies.

The two members with the incorrect answer now know that they were incorrect. Although the computer never evaluated the response by the third group member with the correct response, he now knows that he had been right all along, and incidentally, that his partners were wrong. He compares the feedback statement, not against the response the group entered, but against his own original implicit response. The feedback statement is the same, but the message interpretation varies

with the individual. It is suggested that in this way, the program maintains a degree of individualization.

A descriptive model of this process of learning under individual and group conditions is presented in Figure 1. For the students who work at the terminals individually, there is no discussion phase: each student arrives at an implicit response independently which in turn is make explicit by entering it on the computer terminal. For those who work in groups, discussion of the material precedes the entering of an explicit group response.

Ideally, if all the members of a group agreed on the response to be entered, the confirmation process for each member would be the same as for students who work alone. The response would be entered, evaluated by the computer, and the appropriate feedback given. The feedback would be compared with the response entered and since everyone agreed with the response entered, each member would receive the same information from the feedback statement. If the response entered were correct, positive reinforcement would result and the probability of learning would increase.

The combination of a well-designed program, together with students who have been matched according to background, intellect, motivational level, and other salient characteristics, might well ensure a high probability of response agreement in each group. However, the determination of which characteristics are relevant for matching students to optimize performance remains an area in which much research has yet to be undertaken. In practice, it is more likely to find a high rate of

Learning Through Differential Interpretation of Feedback

Material Presentation Stage	Discussion Result	Response to Computer	Computer Evaluation	Student Interpretation of Feedback	Match	Result

Individual CAI

Individual Response Decision

Agreement Among Members → Explicit (entered) → Feedback → Compared with Explicit Response → Yes → Positive Reinforcement / No

Group CAI

Group Discussion

Further Discussion

Compared with Explicit Response → Yes → Positive Reinforcement / No

Disagreement Among Members → Explicit (entered) → Feedback

Disagreement Among Members → Implicit (not entered) → Compared with Implicit Response → Yes → Positive Reinforcement / No
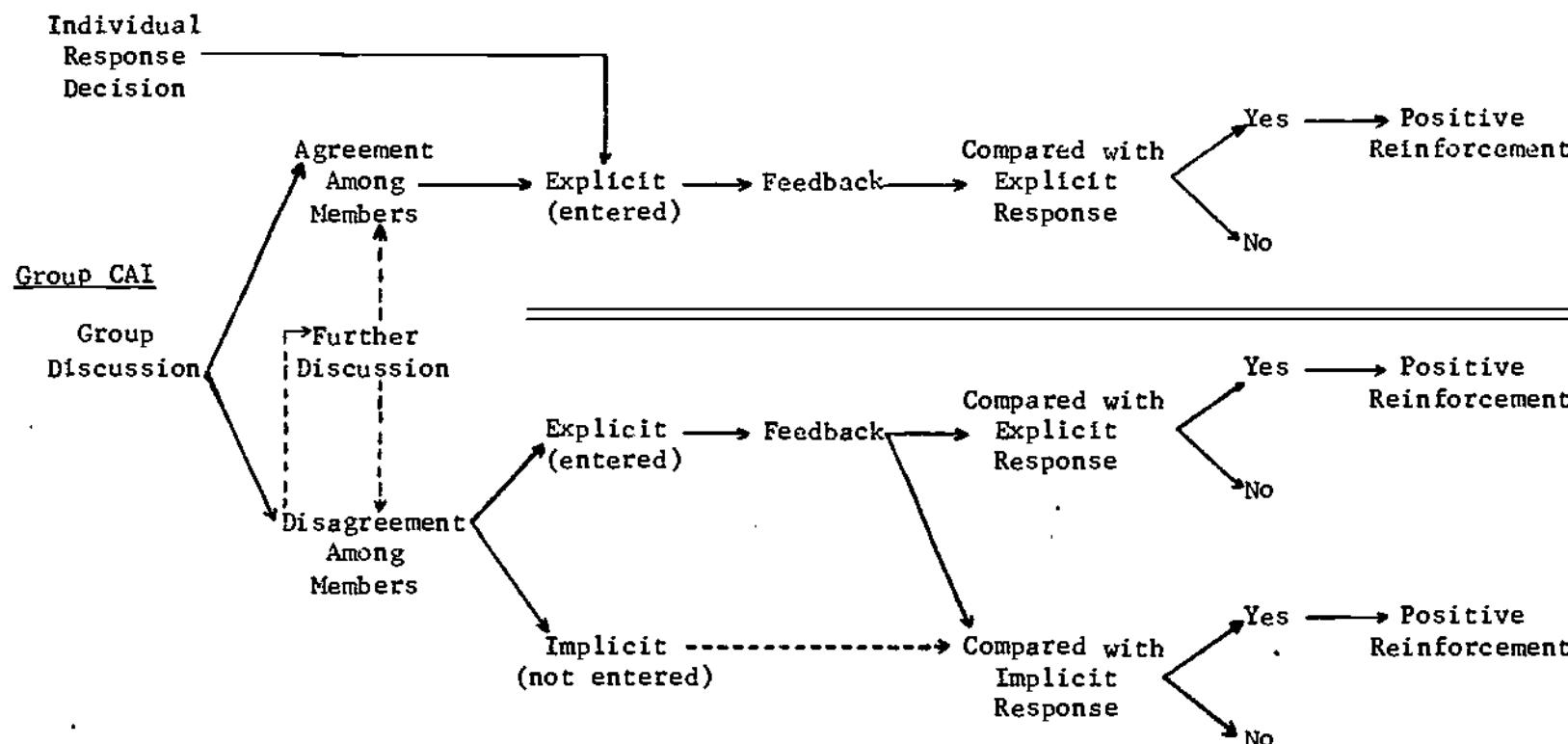
Figure 1

disagreement among members in the choice of a response.

Every disagreement among group members produces essentially two
kinds of responses: an explicit response by the majority of the members
which is entered on the computer terminal, and an implicit response by
the disagreeing member which is not entered on the terminal. Of course,
a disagreement may initiate further discussion in an attempt to achieve
consensus. If consensus is finally achieved, the response is entered
on behalf of everyone in the group and the resulting feedback applies to
each group member.

If consensus is not achieved, the disagreeing member maintains
his own implicit response in the face of the explicit alternative
response entered by the majority of the group. If, by comparing the
feedback to the explicit response with his own implicit response, he
finds he was correct, positive reinforcement occurs. In this way,
learning may occur among some group members and not others, and this
is independent of whether or not the correct response was evaluated
by the computer.

DISCUSSION

To some degree, this model of differential interpretation of
feedback explains how individual learning can occur independent of
generalized feedback to collective group responses. It also suggests
that different processes may be at work when an individual undertakes

to learn in a group rather than alone. For example, the very nature of the implicit response is covert, and there already exists some evidence to suggest that covert responding is as effective as overt responding, and may even be superior under certain conditions (Stulorow and Walker, 1962).

Provision in the model for the holding of an implicit response qualitatively different from the explicit entered response permits a form of simultaneous alternate hypothesis testing in the group setting. The disagreeing member is, in effect, testing an alternate hypothesis, to be indirectly confirmed or rejected by feedback to his partners' explicit response. It may well be that this is the feature of group CAI which, more than any other, allows individual learning to take place.

It should be pointed out that many of the studies of group work with PI and CAI utilized programs originally designed for individuals. It may well be that special programs could be designed for groups to further enhance individual learning. These programs might contain carefully written feedback statements aimed at capitalizing on the differential interpretation effect. Alternatively, group programs might be designed to allow each group member to enter his own explicit response and to receive individualized feedback as in a recent study (Cohen, 1975) thereby altering the nature of the group process.

Apart from the implications for group work, it should be clear that if interpretative processes are to play their full role, feedback statements need to be much more carefully designed than has been

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the case to date. Until now, a major emphasis in automated teaching has been to develop better "frames" and newer methods of response recognition. It is suggested that the design of feedback statements needs at least the same, if not more, careful attention. This is particularly true of more complex types of feedback statements which go beyond simple knowledge of correct results (KCR) and become more explanatory in nature. In this respect, feedback statements can take on a qualitative as well as quantitative component. Since there is a positive relationship between the degree of complexity of a feedback statement and the probability of differential interpretation, careful design of the feedback statement becomes a virtual necessity.

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